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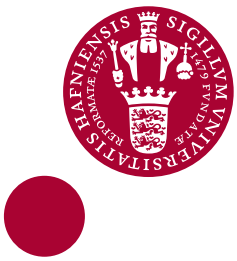

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Original research article

Revealing lay people's perceptions of forest biodiversity value components and their application in valuation method

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ABSTRACT

Valuation studies about environmental goods, e.g. biodiversity, often use characteristics and indicators that seem ecologically sound. But ecological value and public value are not necessarily the same. Therefore, combining ecological indicators with public knowledge and language in framing valuation studies may improve the consistency of outcomes. Using both qualitative and quantitative methods, we investigated lay people's mental constructs about biodiversity and attitudes to biodiversity management.

Applying a coding strategy for analysing data from individual interviews and group discussions revealed that 'diversity of animals and plants', 'natural appearance and dynamics of ecosystem', and 'peace and quietness' were the attributes of forest ecosystems most frequently mentioned by lay people. In addition, it was found that regardless of familiarity with the various ecological scientific terminologies, lay people had an intuitive understanding of ecological concepts such as biodiversity. The analyses demonstrated that individuals' perceptions and values of biodiversity could be framed in two interlinking categories: (i) as a good in itself, and (ii) its regulatory function. It was also revealed that individuals' attitudes towards forests and their biodiversity may be rooted in their mental constructs and can be useful in targeting policy and conservation management.

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1. Introduction

The aim of a Choice Experiment (CE) as a stated preference method in environmental valuation is to understand preferences and trade-offs within a particular population for a particular good/service/state (Coast et al., 2012). Therefore, the identification and characterisation of what is to be valued must be understood by respondents. CE enables consideration of a broad range of policy changes, and respondents must be able to make trade-offs between the attributes in question (Coast et al., 2012). The Lancaster (1966) theory behind CE assumes that individuals derive their utility from the characteristics of goods rather than from the goods themselves. Therefore, any technical or conceptual flaws in presentation of attributes or characteristics in the design of questionnaires may cause a bias. The qualitative techniques of focus group discussions, individual interviews, and other cognitive methods such as thinking aloud and drawing pictures, have been used to improve the awareness of researchers regarding respondents' perceptions, understanding and categorisation of environmental goods when they are answering questionnaires (Gobster, 1998; Fischer and Young, 2007). This has resulted in improved information statements (Powe et al., 2005; Levy and Kellstadt, 2012), but a persistent problem is achieving linkage between

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this improved knowledge of perceptions by researchers and the need for a reductionist and measurable description of the environmental attributes, as required in valuation exercises, management, and prioritisation. The aim of this study is to derive, from qualitative interviews, measurable attributes of biodiversity for a CE that align with perception of lay people and are relevant to management.

It has been argued that the public's lack of understanding regarding biodiversity issues is a barrier to their effective participation in valuation and management programmes (Spash and Hanley, 1995; Hunter and Brehm, 2003). In valuation studies researchers usually take into account the preferences of those respondents who, according to follow up questions, indicate a proper understanding of questions and discard the respondents who do not display the characteristics researchers are looking for and therefore answer inconsistently. Consequently what happens is that researchers measure the preferences of only those individuals who have above-average knowledge of the goods in question, e.g. forest biodiversity in our case.

Thus, securing attribute descriptions, scientifically, which reflect lay people's perceptions may alter this. An obvious critique is, if people have an objectively incorrect knowledge of the good—do we want to value this incorrect knowledge? The question is whether or not the incorrect knowledge arrives from the information provided to them. The answer therefore is, in our opinion, that although focus groups and exploration of the "lay people's mental constructs" are useful tools for building such an explanation of attributes, we need to ensure that the explanation is scientifically sound. In the current study we satisfied this by consulting with a group of scientists.[1]

In the present study we focus on forest biodiversity and use the terms 'biological diversity' and 'biodiversity' interchangeably.

The article is structured as follows: first we present a literature review of studies using stated preference techniques for monetary valuation of forest biodiversity and identify the ways in which researchers have described biodiversity, e.g. using indicators such as number of endangered species and species richness. This is followed by a review of psychological studies of lay people's perceptions of biodiversity, in an attempt to present an overview of the various perceptions exhibited by the public as described in other studies to help to interpret our results. The methods section presents the qualitative analysis undertaken of lay people's perceptions and their mental constructs of forest biodiversity. The results section shows how individuals perceive the concept of "forest", suggests some categories and definitions for future communication, and describes how individuals explain their attitude to and their main relation with forest biodiversity, and consequently with its management. The analysis is based on categorisations found in the literature. Beyond these outcomes regarding forest biodiversity, the results provide the possibility of identifying other important aspects of forest ecosystems from lay people's point of view which can be applied in CE. Then we discuss this integrated approach to understand the concept of forest biodiversity and other characteristics of forest ecosystems to be valued, and the way in which they could be presented to lay people.

1.1. Review of studies using Choice Experiment for valuation of biodiversity

According to Hanley et al. (2001) and Barkmann et al. (2008), insufficient attempts have been made in valuation studies to clarify how lay people perceive unfamiliar and complex terms like biodiversity or species and functions thereof. However, studies on environmental ethics and psychology have tried to clarify lay people's perceptions using qualitative methods. For example, Buijs et al. (2008) suggest that lay people use very deep and complex social representations of biodiversity to argue for particular approaches to biodiversity management. This refers to the situation that although in many cases they cannot explain what biodiversity is, they have some intuitive understanding or awareness of it.

From an ecological view point, Mace et al. (2012) distinguish between three categories of biodiversity: biodiversity as a good in itself, biodiversity as a regulator of ecosystems, and biodiversity as final ecosystem services. However, the authors do not provide any view of these categories for lay people, which is qualitatively based, and it can be questioned whether the categories are embedded in lay people's mental constructs about biodiversity concepts used in valuation studies.

A literature review was used to reveal how researchers have described the characteristics of biodiversity and the integration of the concept into CE. The web of Science was searched for studies, using the keywords (biodiversity* OR "biological diversity*") AND (Choice Experiment*). From the search results, studies were selected based on their primary focus on valuation and the use of biological diversity (biodiversity) as an attribute in CE, i.e. excluding studies that employed CE, but did not include biodiversity as an attribute, or used biodiversity valuation, but not through CE. The search on Web of Science resulted in125 studies and initial scanning showed that 55 of 130 were relevant according to the scope of our research. Fifty articles used species number as an/the indicator of biodiversity, and 30 out of the 50 focused on endangered species. Only five studies included both the number of species and the role of species diversity in the stability and resilience of ecosystems (Table A in the Appendix).

1.2. Concepts of nature and biodiversity in psychological studies

Several studies have found a deficiency in lay people's knowledge of scientific definitions (Spash and Hanley, 1995; Hunter and Brehm, 2003) and, as a result, have suggested better education of the public (Nisiforou and Charalambides,

[1] A group of ecologists and biologists at the Centre for Macro-ecology, Evolution and Climate, Denmark.

2012; Sekercioglu, 2012). Buijs et al. (2008) argue that lay people's definition and understanding of biodiversity is not in the same category as scientific definitions but derived from lay people's daily practice and experiences as well as their emotions and knowledge of their surrounds which help them perceive biodiversity. This may explain why a number of studies find that lay people have a deep perception of biodiversity and ecosystem services despite their limited educational background and knowledge of scientific terms (Buijs et al., 2008; Nisiforou and Charalambides, 2012; Sekercioglu, 2012).

According to Robertson and Hull (2001), Buijs et al. (2006) and Fischer and Young (2007), interconnection and stepwise thinking are the main components of individuals' mental constructs. So, the present study has tried to look at individuals' mental constructs of concepts to emphasise attitudes to biodiversity and forest in a stepwise manner and use this as the basis for attribute generation. Among the categorisations made, the two first mentioned by Mace et al. (2012), e.g. biodiversity in itself and the functionality of biodiversity, come closest to the findings of the present study (see Section 3.2).

2. Materials and methods

2.1. Case study

The study was conducted in the southern region of Scania, with densely populated case areas (www.statistikbanken.dk; www.ssd.scb.se). These highly visited case areas were selected to allow local participants to use their experience of biodiversity and being in a natural ecosystem like a forest when they state their attitude to biodiversity management and conservation.

2.2. Qualitative methods

In the present study, a broad range of qualitative approaches have been applied: unstructured and semi-structured, in-depth interviews, focus group discussions, thinking aloud, and picture drawing. Such approaches have been used to explore phenomena and intuitive understanding of public views of forest-related concepts.

Focus group discussions and individual interviews are research techniques used in marketing and social sciences, and increasingly applied to environmental topics (Robertson and Hull, 2001; Busch et al., 2012) in which data are obtained from a relatively small group of respondents selected from a broader population. The techniques require small groups, led by a facilitator who encourages participants to pursue their own priorities on their own terms and in their own words. This enables the group to address those issues that are perceived as particularly relevant by the participants, rather than issues chosen by the researcher. In addition, the techniques encourage discussions and interactions amongst participants (Bryman, 2008). The number of respondents in qualitative studies are much smaller than those used in quantitative studies (Ritchie et al., 2003; Burke and Larry, 2012) because studying the meaning, and not forming generalised hypothesis statements is the principal aim (Crouch and McKenzie, 2006). Finally, because qualitative research is very labour intensive, analysing a large number of respondents can be time consuming and is often simply impractical. So, researchers generally use theoretical saturation[2] as a guiding principle during their data generation (Bryman, 2008). In the present study eight focus group discussions and 18 individual interviews including unstructured and semi-structured, in-depth interviews have been conducted (see Table 1). In total there were 51 participants.

Participants' ages ranged between 18 and 75 years and the respondent pool was made up of the same age distribution as the general society. Group size varied between three and ten participants and all groups were mixed in gender. Participants had a broad range of backgrounds, including urban and rural lay people, and natives as well as immigrants who have been living in the country for more than 20 years. Participants were chosen randomly from local citizens who are living both near and far from forest areas. Respondents participated in either one focus group or individual interviews but not in both.

In addition to individual interviews and focus group discussions, we made use of picture drawing during individual interviews to mitigate any constraining feelings amongst respondents caused by unfamiliarity with technical words and allow them to express their own perceptions by drawing their answers rather than communicating them verbally. This method has been successfully used by Matthews (1985), Gobster (1998) and Fischer and Young (2007). The present study has the same objective as Fischer and Young (2007) in the characterisation of individual mental constructs of biodiversity, but additionally tries to use this information as a basis for defining attributes and relevant policy levels to be used in valuation methods. Attempts were also made to identify a management scheme which is in tune with what lay people expect from policy makers. We had some questions which helped us to see how lay people frame their views of forest biodiversity management (see research questions in the appendices).

2.3. Data coding

The interviews in Danish, Swedish and English were digitally recorded and then later transcribed with the help of trained translators. The initial research questions were used to design the discussion guideline for the first focus group, and were subsequently adjusted (Fig. 1).

[2] Theoretical saturation is the phase of qualitative data analysis in which the researcher has continued sampling and analysing data until no new data appear and all concepts in the theory are well developed. Concepts and linkages between the concepts that form the theory have been verified, and no additional data are needed.

Table 1
Information about interviews and focus groups discussions.

Type of interview	Participants no.	Age range, years			Country-region	Sex
		18–36	37–59	+60		
[b]FG1-F[a]	3	2	1		Denmark–Funen	M/F
FG2-F	5	2	2	1	Denmark–Funen	M/F
FG3-F	5	2	1	2	Denmark–Funen	M/F
FG1-Z[c]	5	4	1		Denmark–Zealand	M/F
FG2-Z	5	5			Denmark–Zealand	M/F
FG3-Z	4	2	2		Denmark–Zealand	M/F
FG1-S[d]	3		2	1	Sweden–Scania	M/F
FG2-S	3	2	1		Sweden–Scania	M/F
In[e]-F	4	2	2		Denmark–Funen	M/F
In-Z	8	3	3	2	Denmark–Zealand	M/F
In-S	6	1	4	1	Sweden–Scania	M/F

[a] F: Funen.
[b] FG: focus group discussion.
[c] Z: Zealand.
[d] S: Scania.
[e] In: individual interview.

(A) Introduction to the rationale of the study: a discussion group on the perceptions of ecosystems (which refers to the perception of nature).

(B) Open discussion of different aspects of nature (ecosystem) (to learn what lay people perceive as a representative of nature in this case).

(C) Open discussion to investigate personal experience of forest, e.g. any favourite animals or plants.

Participants are asked to draw a picture of their preferred forest.

(D) Open discussion to find out whether participants are able to apply and perceive ecological principles which they have implicitly mentioned, e.g. their knowledge about biodiversity and ecological concepts. They are shown pictures of forests differing in terms of tree species and asked to state which one they prefer and why.

(E) Open discussion of man-forest/biodiversity relationship and asking for suggestions to improve forest quality.

(F) Open discussion and in-depth individual interview to identify understandable equivalent for central terms used in CE.

Fig. 1. The focus group and individual interview guideline which is implemented stepwise.

The coding strategy, used in a stepwise manner Glaser and Strauss (1967) guided the data analysis to provide insight and an easy understanding of public perceptions. Data were recorded for each individual in both the individual and focus group interviews.

Fischer and Young's (2007) approach was applied to analyse individuals' mental constructs and includes a stepwise procedure: (i) an explicit word or expression which categorises a concept, (ii) definition of the concept, and (iii) an ideal illustration or image which is a representative of the concept. First, researchers developed clearly defined categories of the concept through understanding lay people's perceptions of forest biodiversity using their own wording, and then expanded on this by collecting data regarding an ideal image of the concept. Based on evidence from qualitative studies, a fundamental step towards understanding forest biodiversity is through acquiring an in-depth knowledge of the human relation to biodiversity (Buijs et al., 2006; Fischer and Young, 2007). In addition to the steps presented by Fischer and Young (2007),

participants' attitudes to forest ecosystems were analysed to see how lay people frame their view of forest biodiversity management.

3. Results and discussion

The results and discussion are organised into three parts. The first part describes lay people's mental constructs of forest biodiversity in order to find suitable labels and definitions for concepts, the second part illustrates their ideal image of the concepts and, finally, their perception of the relationship between man and forest – and consequently its biodiversity – is described and discussed.

3.1. Lay people's mental construct of forest biodiversity

3.1.1. Knowledge of and familiarity with the scientific term 'biodiversity' (Identification of categories of forest biodiversity)

In order to investigate participants' knowledge of and familiarity with the scientific term forest biodiversity they were, at the beginning of the discussions, asked if they had heard about the term and if so, what it meant to them. The aim was not to identify any right or wrong answers but to find the range of lay people's understanding of the term. Data were recorded for all 51 participants.

The answers were divided into three groups: (i) about 20% of participants had not heard of the term and could not give any definition, (ii) about 12% of participants had heard the term in the media but could not give a definition, and (iii) about 68% of participants could give a definition of the term (for frequency report see Table B in appendices). The latter group mainly consisted of members of organisations dealing with ecosystems (e.g. NGOs for natural resource conservation), regular forest visitors (e.g. activities such as fishing, hunting, horseback riding, and walking) and school teachers, especially elementary school. They stated some definitions, where the following is a quite general view:

> "[Biodiversity] is not a common word in daily life but I think it means variety in everything that is related to living creatures". (FG-Z1)

Some respondents, mostly students, provided more specific definitions, e.g. they defined forest biodiversity as different animals and plants, and some referred to diversity of species as well as genes:

> "Today we need a variety of animals and plants and their genes because they are important to us when making drugs. So forest biodiversity is a variety of genes". [FG-F1]

Among lay people who knew the term from the media, several had misunderstood it. They defined forest biodiversity as a tool for maintaining ecosystems, and some of them connected it with debates about climate change. This shows that the term has been widely used in the media which has attracted lay people's attention to it, and some participants restricted their description to media's headlines and stereotypes.

The results show that about 80% of respondents are familiar with the term biodiversity. This is in line with Fischer and Young (2007), who suggest that lay people are more familiar (though not in a scientifically precise manner) with the term forest biodiversity than what has been found in earlier studies, e.g. Spash and Hanley (1995) and Hunter and Brehm (2003).

Through focus group discussion and individual interviews, as well as drawing exercises, we found that regardless of their educational level, participants had a deep understanding of their environment, forest biodiversity and ecological concepts such as ecosystem equilibrium, nutrient cycles (food chain), and natural dynamics. Table 2 shows the frequency of forest attributes which were mentioned by participants.

Drawings were used as a way to construct a normative image of forest biodiversity and ecosystems, see Matthews (1985), Gobster (1998) and Fischer and Young (2007). This was revealed at the later stages of discussions in particular. Respondents could illustrate more depth to their perceptions about the subject through drawing as compared to when they were interviewed and had to answer faster. This notion of giving time for respondents to increase their preference certainty has been touched upon in some stated preference studies, and the result is in line with Lauria et al. (1999), Svedsäter (2007) and Cook et al. (2012) who argue that in most cases, especially for unfamiliar goods, giving time to respondents may help them to discover their preferences and consequently increase their certainty when answering hypothetical questions.

3.1.2. Definition of categories

3.1.2.1. Perception of forest biodiversity as a good in itself. Respondents' definition of forest biodiversity during interviews showed that variety of living beings in public surroundings were a dominating value (was mentioned by around 96% of respondents). It was found that the aesthetic value of forest biodiversity was the first factor attributed to its value. This shows that lay people's value of forest biodiversity includes cultural values such as appreciation of wildlife and scenery, and educational and recreational values. Most participants held holistic views in their appreciation of forest biodiversity and referred to a diverse landscape, including different animals, plants and colours, and sometimes different habitats and genes. Participants were explicit that the existence of a variety of animals and plants was more important than any specific species. For example, as can be seen from Table 2, a relatively small number of respondents (49%) mentioned charismatic

Table 2
Frequency of attributes mentioned by respondents about forest biodiversity value.

	Frequency	Percent
Variety of animal and plants and micro-organisms (a holistic view not limited to any specific species)	49	96
Insurance and resilience of forest (stability) due to variety of species	49	96
Number of charismatic animals and plants (old beech trees, native birds.)	25	49
Aesthetic value	30	58
Educational value	18	35
Getting peace and quietness	49	96
Experience something exciting/adventure	15	29
Naturalness of forest	50	98
Potential value of wild medicines and genes	3	5

animals and plants, such as old beech trees and native birds, and they attributed a negative value to invasive species. During interviews it turned out that, for seven of 51 respondents, the existence and observation of some specific species (use and non-use value) is superior to diversity of species per se:

> "I personally like to have a mixed forest but sometimes you see only Christmas trees. And there I don't like to go for a walk. But I can walk for hours in a forest which has only beech trees". (FG-S1)

Existence value was a motive found implicitly in many parts of lay people's wordings. It covers valuing an ecosystem for its inherent value regardless of its usefulness to man. For example, it was mentioned in one of the focus groups in Zealand:

> "I like forests and think about them, and I am happy to hear that they are still alive, even if sometimes I don't have time to go there" (FG-Z1).

3.1.2.2. Perception of forest biodiversity as regulator of the ecosystem. During the discussions, it was revealed that around 96% of participants had an intuitive understanding of the contribution of forest biodiversity to ecosystem processes. One of the concepts stated by participants to advocate for conservation of forest biodiversity was biodiversity as a regulator of ecosystem processes, and its role associated with ecosystem resilience:

> "When I see pictures of two forests, one with few different animals and plants and the other with lots of them, I would say that the forest with different species is the more stable. In case of some diseases I would say that if forest has just one species, it will die but in case of different species it can survive". [FG-Z1]

Participants mentioned the concept of stability in connection with food chain, showing that they think maintenance of natural productivity helps the stability and balance of ecosystems. Similar results are reported by Fischer and Young (2007).

> "I think all of these species need each other. Cows and sheep need grass and wolves like sheep. When there are a variety of animals, they have different food choices and never stay hungry if they lose one type of food". [FG-S2]

A member of a farmer family explicitly pointed to the food chain as a natural cycle:

> "The interesting thing is that there are different animals in the forest, such as beetles and birds, and there are flowers. They show a hidden cycle within ecosystem which is like a chain connecting living creatures". [I4-Z1]

The two categories above (Sections 3.1.2.1 and 3.1.2.2) are in line with two of the three categories suggested by Mace et al. (2012). However, our results from interviews did not support the third category: forest biodiversity as a final ecosystem service. This category mainly refers to the biological diversity which contributes to some goods and values at the level of genes, e.g. the potential value of wild medicines (was mentioned by only three of 51 participants).

3.1.2.3. Discussion of the two categories of forest biodiversity in valuation. The two categories supported by Mace et al. (2012) are based on ecological viewpoints and show biodiversity categories within the concept of ecosystem. Buijs et al. (2008) consider biodiversity in itself and its functions in one category called "the functions and benefits associated with biodiversity", including aesthetics and recreational value. Our results show that these values are more related to forest biodiversity as a good in itself, while such values as ecosystem resilience or ecosystem regulator are more related to ecosystem balance, and forest biodiversity is a factor that complements and enhances some ecosystem services. Distinguishing between these two categories is important in framing conservation policies since, according to Mace et al. (2012), they can each be a separate target for policy. For example, although people value places with more diversity of species, particularly charismatic species, policies sometimes target keeping a specific species which is valuable in terms of its function for ecosystem and favour conditions which do not support a diverse community, e.g. heather moorland in the UK. The issue is that if policy makers want to obtain public support they should consider whether policies are in line with what target groups (e.g. lay people) prefer about forest biodiversity.

Studies that consider both functionality and value of biodiversity as a good in itself, e.g. Christie et al. (2006), Czajkowski et al. (2009), Eggert and Olsson (2009) and McVittie and Moran (2010), are fairly in line with our argument because our understanding of individual mental construct illustrated that what is important is not just species number or biodiversity

as a good in itself (e.g. appreciation of biodiversity, and spiritual, educational, recreational and cultural values), but that biodiversity also has a value as a regulator of ecosystem processes and functions. Even if the four studies above cover both dimensions of biodiversity corresponding with lay people's mental constructs, their line of investigation is a bit different from that of the present study. First, they are used to present a scientific term to lay people. We argue that not only identification of attributes is important to valuation studies, but also to use terms phrased in lay people's language is essential to increasing familiarity with the concept and presumably to getting more valid results. Next, formulating attributes (goods) compatible with lay people's mental construct is important. In our study, it turned out that the two aspects of biodiversity, mainly presented as species number and functionality, are interconnected and lay people perceive them as one attribute, while they have been presented separately in the above studies. The idea is that one can get people thinking of a broad concept of forest biodiversity and use indicators to communicate different levels and compositions of biodiversity. So, using species numbers as an attribute of a CE study would not cover the true value the general public has for biodiversity. This is the case in the majority of studies reviewed. Therefore, we argue that a bottom–up procedure for attribute selection, based on images of lay people's mental construct towards abstract concepts (e.g. biodiversity and forest) may be a better way to achieve alignment of lay people's perceptions with environmental policy.

3.2. An idealistic image of forest biodiversity, and its importance to valuation

It was revealed that participants had two images of forest biodiversity. One image covered the present situation of biodiversity and the other was a normative concept used as an ideal condition of biodiversity in their region. Participants' drawing and discussion showed that for most participants (around 49 of 51 respondents) the ideal condition included a very low level of human interventions and most of participants (around 48 of 51) agreed that when forest cannot manage itself, expert intervention is needed at some point.

> "I definitely think that it is man who destroys forests with his immature thought and plan. They have to be left alone, but in situations where forest has been destroyed, it needs extra help from the outside to be recovered, and man should do something to save forest and help it". (FG-Z2)

This perspective has also been reported by Hull et al. (2003) who found that among participants an understanding of natural dynamics and balance was rooted in the context of nature, while Fischer and Young (2007) reported absence of human intervention as the ideal picture among their participants.

According to the results, around 96% of participants had a holistic view of animal species which included all kinds, not only a specific group such as endangered species, but about 80% of participants mentioned the presence of native species as the ideal. This is in line with Buijs (2009), who tries to investigate our understanding of lay people's interpretation of the intrinsic value of nature. Within the wilderness image, the intrinsic value of nature is interpreted in a holistic manner and directed at species and ecosystems ("eco-centrism").

The above description of the idealistic images is important for the reference point respondents who take part in a valuation survey. Typically, we assume that people's marginal utility depends mainly on the current situation which we use as the reference point. However, if people use an idealistic image of nature as their reference point, it may be problematic to use—changes may be perceived as much larger. So if what respondents have in mind as a reference point is too different from what we determine as a reference point for them (status quo), respondents may refuse or are not able to (fully) take on the role we ask them to. As a reference point, people may adopt the context and habits they are used to when making a trade-off. This means that they may apply this as their response frame, regardless of what role or frame the researcher asks them to take (Samuelson and Zeckhauser, 1988). Presumably, this causes an underlying variation and mismatch regarding respondents' preferences. Our argument for the importance of determining reference points originates from Prospect Theory (Kahneman and Tversky, 1979). In the literature regarding risk perception, numerous studies building on the prospect theory find that people are influenced by their own perceptions of risk when evaluating choices with specific risks attached (e.g. Jakus and Shaw, 2003). The issue has been addressed in some valuation studies such as Hu et al. (2006), Sugden (2009), Hasund et al. (2011), Ericson and Fuster (2011) and Lundhede et al. (2012). These authors argue that the value that an individual expresses for an attribute is not derived from its fixed level, but is based on its departure from a reference level or point. The reference point can depend on experience with the good to be valued, expectations which we here call ideal image or current situation, and pertains to 'what it is now'. Identifying the perceived reference point in valuation studies is therefore important. Not using idealist images of nature as a reference point in valuation studies do not necessarily invalidate the estimated results. However, being aware of it would be useful knowledge for better interpretation of the respondents' desires and preferences, and may reduce the existing mismatch/discrepancy in preferences and improve the accuracy of aggregate measures for decision-making documents.

3.3. Man–nature relationship and public attitudes to forest biodiversity conservation

Respondents used the term nature to address a concept which covers the entire ecosystem of which forest is one example, and biodiversity is its component.

Table 3
Man–nature relationship and public attitudes to forest biodiversity conservation.

	Frequency	Percent
Man perpetually belongs to the ecosystems like forest	38	74
Man's relation to the ecosystems like forest when situated in it	49	96
Ecosystem management for human needs	22	43

Results illustrate three views of the perceived relationship between man–nature (Sections 3.3.1–3.3.3) and continue with lay people' attitudes to biodiversity (Section 3.4):

3.3.1. Man perpetually belongs to ecosystems like forests

> "We are part of nature and connected with nature no matter whether we are in the city or in the forest, because nature is everywhere". (FG-F1)

About 38 of 51 participants stated that man is part of the ecosystem (Table 3). They considered ecosystem as a 'home' and therefore, they argued, being in an ecosystem like the forest made them feel responsible for all ecosystems and their components, e.g. biodiversity. This group of participants were in favour of conservation activities and management with little human intervention to improve the natural condition. They had an eco-centric view, believing that biodiversity and nature are entitled to be conserved. They were mostly lay people who visit the forest regularly or are members of NGOs for conservation activities.

3.3.2. Man's relation to ecosystems like forests when situated within them

Table 3 shows that around 49 of 51 responses revealed that lay people may have different feelings about the forest depending on whether they, so to say, are part of it or not. Not staying in or close to the forest translated to less worry about forest. In addition, such participants mostly approved of management with a focus on both ecosystem regulation and human benefits, i.e. they had a combination of eco-centric (dominating) and anthropocentric views.

> "When I am in the forest I feel I am part of nature but when I am in the city I don't think much about forest since I am not part of it anymore, with that noise and stress. I believe the forest can manage itself and its natural processes and we do not need man to turn its wheel. But when we want to make man-made forest or gardens which are not natural, they need our help and management to survive and become mature". [FG-Z2]

3.3.3. Ecosystem management for human needs

> "We should manage ecosystem and take care of it because we need nature for our life. I believe that when we need to keep our home warm, we can remove trees from the forest for making fire. Leaving deadwood in the forest is like not using fruits which we all know is a waste of resource". (FG-Z2)

A smaller number of interviewees (about 22 of 51 participants) viewed forest ecosystems as a source to fulfil human needs, with such needs weighing more than the maintenance of natural ecosystems. They were in favour of applying management for human well-being, not for the sake of biodiversity or the ecosystem itself.

3.4. Man–forest biodiversity relationship and its importance to valuation

Based on our results, we argue that participants distinguished between 'bio' and 'diversity'. They paid attention to 'bio' in a holistic view, with little regard to species charisma or whether species were rare or endangered. This is in line with Buijs et al. (2008) and Lundhede et al. (2012). However, many valuation studies tend to focus on specific species. Thus, some studies such as Loomis and White (1996), White et al. (1997, 2001), Jacobsen et al. (2008), and Richardson and Loomis (2009) found that charismatic or iconised species (for example elephants, pandas and otter) are valued higher than non-charismatic species like brown hare. We do not make a real comparison, but we do find that using specific species, charismatic or not, is probably not a good way to describe biodiversity as it does not cover the entire concept—if the aim is to define biodiversity. However, some participants did reveal a moral obligation to take care of specific species, and if this is a dominating view in the general population, it may drive the higher WTP often revealed when valuing specific species instead of species in general. And this may be even more pronounced when dealing with endangered species, see, e.g. Jacobsen et al. (2008). Since, according to our interview results, participants had a holistic view of biodiversity; our conclusion is that when specific species are valued, this value does not necessarily reflect the value of 'bio'.

Another insight from our results is that participants had differing views regarding the relationship between man and forest biodiversity conservation. "Man is responsible for maintaining biodiversity and the respondents want to be part of conservation activities" was a dominating statement among participants and they perceived human activities as

the main reasons for ecosystem degradation. This shows that participants, in addition to the preference they have for biodiversity conservation, also care about *how* forest biodiversity is conserved. This is in line with Hanley et al. (2003), who say that information on relative preferences for a conservation policy, e.g. goose conservation, is essential since it can help policymakers adjust conservation policy to adhere more closely with taxpayer requests. The general public does not necessarily have the same preferences as experts (Hanley et al. 2003). Thus, an obvious discussion would be whose preferences are most central in designing policy. What this study suggests is framing economic methods such as choice experiments in accordance with general public preferences from the early stages and at the same time, using iteration steps, try to secure scientific credibility of good definitions and policy frameworks as well.

4. Conclusion and contribution of the qualitative method to valuation study design

The design of a choice experiment implies decisions about the policy alternatives, which attributes, how many attribute levels, and which attribute combinations are feasible (Louviere et al., 2000). The discussion above reveals that a thorough qualitative assessment of respondents' perceptions of nature may facilitate a translation into useful attributes and alternatives. There are, however, unresolved challenges associated with the qualitative work, most particularly in the tension between the usual purpose of such work (to obtain an intuitive understanding of phenomena) and the essentially reductive aim of describing all the key concepts of care in as few attributes as possible (Coast et al., 2012).

In regard to the dominating attributes of forest ecosystems from lay people's views, the first dominating component (Table 2) was forest biodiversity where participants revealed a holistic view (combination of animals, plants, and micro-organisms). About 96% of participants placed values on biodiversity beyond merely the number of species in the ecosystem. Therefore, a broader attribute capturing biodiversity is therefore more appropriate than using current indicators such as species richness. Secondly, participants showed that the concept of 'naturalness' in ecosystems is very important to them. In their views, maintenance of ecosystem naturalness through a low level of intervention, such as leaving dead wood in the forest, was an acceptable way of maintaining balance in the food chain and nature, as well as its natural appearance and structure.

Achieving peace and quietness was another dominating characteristic emphasised by lay people, especially people who lived near forests. This should be used in CE studies as a measurable attribute of forest ecosystems.

Apart from identifying dominating attributes of forests from lay people's views, this study has three key findings which may be useful for improving the design of questionnaires and environmental economic valuation studies. First, one issue is the inseparable essence of functionality value and value of biodiversity in itself in lay people's mental construct. Therefore, valuation studies using only species numbers may not reflect the true value of nature, and there is a risk of ignoring its functionality value.

The second issue refers to the fact that in designing choice experiments we utilise the present situation as a benchmark for lay people, and ask them to make a trade-off based on that. But according to the qualitative results we found that respondents in some cases have an ideal image as a point of departure which is not fully matched with the status quo. Therefore, being aware of the ideal image of respondents would be useful for better interpretation of the respondents' desires and preferences, and may reduce mismatch/discrepancy in preferences and improve the accuracy of aggregate measures for decision making documents.

The last issue refers to the management scheme preferred by lay people to be considered by managers and policy makers in defining the policies to be supported by lay people. It shows that participants at the time of answering a valuation exercise, in addition to the preference they have for biodiversity conservation, also care about how biodiversity is conserved. This refers to the framing of different hypothetical alternatives which should be in tune with respondents' preferences.

Lay people were mainly in favour of a type of management which is in between active and passive management because they do not want large-scale human intervention in ecosystems, but they are in favour of management which they can be involved in.

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Appendix A

See Tables A–D.

Table A
List of articles used in the literature review.

	Biodiversity as:	A good in itself				A regulator of ecosystem process
		Species number	Endangered species	Habitat preserved	Beauty of biodiversity	
1	(Hanley et al., 1998)	x				
2	(Boxall and Macnab, 2000)	x	x			
3	(Lehtonen et al., 2003)	x	x			
4	(Scarpa et al., 2003)	x	x			
5	(Garber-Yonts et al., 2004)	x	x			
6	(Watson et al., 2004)	x	x			
7	(Hanley et al., 2005)	x				
8	(Colombo et al., 2005)	x	x			
9	(Powe et al., 2005)	x				
10	(Horne et al., 2005)	x	x			
11	(Naidoo and Adamowicz, 2005)	x	x			
12	(Christie et al., 2006)	x	x			x
13	(Nielsen et al., 2007)	x	x			
14	(Jacobsen et al., 2008)	x	x			
15	(Barkmann et al., 2008)	x	x	x		
16	(Travisi and Nijkamp, 2008)	x	x			
17	(Meyerhoff et al., 2009)	x	x	x		
18	(Do and Bennett, 2009)	x	x			
19	(Verissimo et al., 2009)	x				
20	(Lundhede et al., 2012)	X		x		
21	(Eggert and Olsson, 2009)	x	x			x
22	(Rajmis et al., 2009)	x	x			
23	(Czajkowski et al., 2009)	x	x			x
24	(Chan-Halbrendt et al., 2010)	x				
25	(Susaeta et al., 2010)	x				
26	(Westerberg et al., 2010)	x	x			
27	(Asrat et al., 2010)					x
28	(Hasund et al., 2011)	x	x	x		
29	(Hanley et al., 2010,?)	x	x			
30	(Juutinen et al., 2011)	x	x			
31	(Jacobsen et al., 2011)	x				
32	(Christie and Gibbons, 2011)	x	x			x
33	(Zander and Garnett, 2011)			x	x	
34	(Drechsler et al., 2011)	x	x			
35	(Rossi et al., 2011)			x	x	
36	(Glenk and Colombo, 2011)			x		
37	(Hynes and Campbell, 2011)	x		x		
38	(Jacobsen et al., 2012)	x				
39	(Broch and Vedel, 2012)	x				
40	(Zhao et al., 2013)	x				
41	(Adamowicz et al., 1998)	x	x			
42	(Blamey et al., 2000)	x	x			
43	(Shoyama et al., 2013)	x	x			
44	(Broch et al., 2013)	x				
45	(Rogers et al., 2013)	x	x			
46	(Jacobsen et al., 2013)	x				
47	(Cerda et al., 2013)	x			x	x
48	(Di Minin et al., 2013)	x				
49	(Hoyos et al., 2009)	x	x			
50	(Thein et al. 2012)	x		x		
51	(Colombo et al., 2013)	x				
52	(Dallimer et al., 2014)	x				
53	(Jobstvogt et al., 2014)	x				
54	(Tempesta and Vecchiato, 2013)	x				
55	(Yao et al., 2014)	x				

Table B
Have you heard about the term 'biodiversity'?

	Frequency	Percent
(i) Respondents had not heard about the term and could not give any definition	10	20
(ii) Respondents had heard about the term in the media but could not give a definition	6	12
(iii) Respondents could give a definition of the term	35	68

Table C
Frequency table on an idealistic image of forest biodiversity.

	Frequency	Percent
Very low level of human interventions	49	96
Presence of both animals and plants and micro organisms	48	94
Presence of endangered species	30	59
Presence of native species	41	80

Table D
Example of coding stepwise process.

Name	Question	Original speech text	Open code	Axial code	Selective code
Mitra 51 IT counsellor	Meaning of nature.	It reminds me of forest mountain water lake. All of these different not man-made things.	All of these different and not man-made things.	Perception about nature which is a general concept and not man-made.	Nature is not artificial. Diversity as a part of nature
	Relation between human and nature.	My relationship with nature is that we are responsible to take care of it. Don't damage it. We are a part of nature. I love green nature. I don't like desert and dry lands. I like flowers.	We are responsible to take care of it. Don't damage it. We are a part of nature.	Man is responsible for conserving nature.	Responsibility for conservation and management.
	Nature in what respect is it valuable for you?	It is valuable. Our health depends on nature. If forests and waters get polluted and destroyed we cannot have a healthy life as well.	Our health depends on the health of nature and forest.	Natural process of forest to keep its health.	Natural process of forest to keep it healthy and sustained.
	Use of nature	Recreation and walking in the forest, camping and picnic are enjoyable for me. I remember when my kids were in elementary school, their teachers took them to the forest and showed them leaves, trees and they taught them. So forest can be like a class for studying nature. Honestly I am scared of most animals like snakes, bears and don't like go to the forest for just watching them. But it does not mean I don't like them to be alive and live.	I think recreation and walking in the forest, camping and picnic are enjoyable for me. So forest can be like a class for study about nature.	Recreation and walking are enjoyable.	Recreation value of forest (use value of forest). Education value of forest (use value of forest).
	Role of people and government in conserving nature	I think the role of man in nature is that they should be careful not to ruin and pollute it, not try to manage it because nature has been before us and knows how to manage itself better.	They should be careful not to ruin and pollute, it, not try to manage it, because nature has been before us and knows how to manage itself better by its natural actions.	Nature is not seen as fragile, but as resilient and robust. The protection of nature is also important, but they believed nature can adapt itself individually to changing circumstances.	Autarkic and self-sufficiency of nature = natural ecological process. Passive management. Its power and sustainability.

(*continued on next page*)

Table D (*continued*)

Name	Question	Original speech text	Open code	Axial code	Selective code
	Meaning of biodiversity	It means different living creatures, and different places. I prefer forest with different animals and trees, because first I think it is much more beautiful than having just one species and I enjoy it more. Next, I think it is an essence of nature to have different and mixed trees and animals and it is useful for wildlife because they need each other, some of them are the food for the others and it is a principle or a mystery of nature. I like to see flowers, grassland, bushes, trees and rivers when I go to the forest.	It means different places and living creatures. I prefer a forest with different species because I think it is much more beautiful. It is an essence of nature to have different and mixed creatures; it is useful for wildlife because they need each other. Some of them are food for the others and it is a principle or mystery of existence of nature.	Aesthetic aspect of diversity of species and its diversity helps forest and nature existence.	Aesthetic aspect of biodiversity (use value of forest) Biodiversity makes forest more stable and flexible = stability of nature because of diversity of animals.
	Effect and benefit of biodiversity	I think all of these species need each other and being more diverse helps forest to be sustained.	All of these species need each other and being more diverse helps forest to be sustained.	Perception of diversity.	Functionality of biodiversity.
	Dead wood	I think as much as possible we should try to keep the forest and avoid intervention in its naturalness by avoiding removing dead trees and leaves from the forests (it looks natural with old trees).	Avoid intervention in its nature. Avoid removing dead trees and leaves from the forests. It looks natural with old trees.	Keep naturalness of forest by leaving dead wood there.	Naturalness of forest ecosystem.
	Restriction	I think restriction for improving the forest is a well acceptable scheme but just retain some open places for us.	Restriction for improving the forest is a well acceptable scheme.	Positive reaction for restricting part of the forest in order to improve it as a passive management.	Acceptance of restriction for conservation. Passive management.
	Conserving of nature	I am ready to limit my needs a little bit to save the forest for the next generation. Forests are our heritage; their presence has value for me.	Limit my needs a little bit to save the forest for the next generation. Forests are our heritage; their presence has value for me.	Think about nature is for next generation.	Non-use value.
	Considering the current situation of forests in your country, what do you think of the necessity of a project to conserve and enhance forest and nature?	Here the constitution is in favour of nature compared with a developing country. Because of poverty, governments cannot pay much attention to nature and people's need is the first priority for them. Actually as an another example, here my neighbour wanted to cut some trees in front of our building to extend the parking space but the municipality did not let him. And it is a kind of lesson and also enforcement for us to learn that we should not destroy nature. I think managing nature or forest should be with layman's cooperation, otherwise people cannot accept it.	Constitution is in favour of nature. Managing nature or forest should be with layman's cooperation, otherwise people cannot accept some restrictions and rules.	Enforcement in conservation programme. Cooperation in management.	Reliability and enforcement in policy. Passive management but with layman's cooperation.

Appendix B

Research questions used during individual and focus groups discussions (mix of qualitative and quantitative questions).

1. What does nature mean to you? Explain nature and explain its role in your life.
You could draw a picture of what you think of nature.
2. What would you feel about your relation with nature? Explain your answer?
2.1 Choose the option you agree most with:

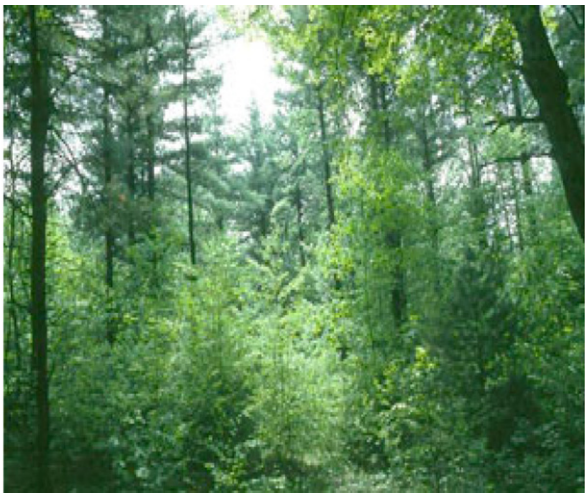
- I am a part of nature.
- I am not a part of nature because I live in a city and do not find myself in nature.
- I am a part of nature because man is part of nature.
- I feel like a part of nature when I am in the forest but not when I am in a city.

If you want to answer anything other than what has been proposed above, write your answer here:—

3. In the table below you will see different reasons for visiting a forest. To what extent are these reasons important to you?
When I visit a forest, it is important for me:

	Not at all important	A little important	Somewhat important	Important	Very important
To see the beautiful scenery		☐	☐	☐	☐
To look at plants and animals					
To relax	☐	☐	☐	☐	☐
To experience peace and tranquillity	☐	☐	☐	☐	☐
To feel free	☐	☐	☐	☐	☐
To escape from the everyday routine	☐	☐	☐	☐	☐
To be alone	☐	☐	☐	☐	☐
Being with friends and family	☐	☐	☐	☐	☐
To experience something exciting/adventure	☐	☐	☐	☐	☐

If you have other reasons please talk about it.
4. Have you heard about biodiversity?
5. What does the term biodiversity mean to you?
6. What difference do you see in a forest with the presence of many different species of plants and animals compared to a forest with a low degree of biological diversity (with few different species of plants and animals?
7. Can you name your favourite trees, plants or animals?
9. Look at the below photos, which forest do you prefer? Explain why.



10. What will the consequences be if about half of biodiversity of forests in your country, i.e. 50% of trees, plants and animal species, are dying out?

Look at the two pictures:

11. What do you think is best to do with the dead trees in the forest? Explain your reasons.

- I prefer to leave the more mature trees to decay in forests.
- I prefer removing old and dead trees from the forest and use them.

12. If you would be willing to pay for forest improvement, where would you prefer to see your money used?

- Near where I live in my own country.
- Near where I live, regardless of the fact that it is in my home country or in a neighbouring country
- In my country.
- Where nature is threatened.
- Where the quality of nature is high.

Please explain your reason:

14. Considering the current situation of forests in your country what do you think of the necessity of a project to conserve and enhance forest and nature? Explain your reason.

15. What do you think about putting restrictions on the use of nature to protect it? Explain your reason.

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